

Research Note

Avian Hematozoa of Adult and Nestling Cooper's Hawks (*Accipiter cooperii*) in Wisconsin

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ABSTRACT: Blood from 80 adult and nestling Cooper's hawks in 8 Wisconsin counties was examined for hematozoa. In 1991, 13 of 19 adults harbored *Haemoproteus* sp., 17 of 19 had *Leucocytozoon toddi*, and 1 of 19 exhibited one unidentified microfilaria; and 2 of 4 nestlings were infected with *L. toddi*. In 1992 16 of 28 adults had *Haemoproteus* sp., and 26 of 28 adults and 2 of 29 nestlings possessed *L. toddi*. Adults as old as 6 years were infected with *L. toddi* and *Haemoproteus* sp.

KEY WORDS: Cooper's hawks, *Leucocytozoon toddi*, *Haemoproteus* sp. microfilariae, hematozoa, Wisconsin.

In the early to mid 1900s, populations of Coopers's hawks (*Accipiter cooperii*) were in serious decline in the eastern U.S. (Rosenfield, 1988). In Wisconsin it was listed as a threatened species in 1979. As part of a long-term study of a stable breeding population of Cooper's hawks in Wisconsin (Rosenfield et al., 1991) blood samples were collected and analyzed to establish baseline data for future hematozoan studies.

Adult Cooper's hawks were trapped near their nests with mist nets as described by Rosenfield et al. (1992). Nestlings were collected by hand from 38 tree nests, 10–23 m above ground in 8 counties in central and southeastern Wisconsin. Blood was taken with a syringe from the brachial vein of breeding adult and nestling (ca. 10–25-day) Cooper's hawks during 23 June–11 July 1991 and 14 June–10 July 1992. Thin smears were made on microscope slides, air dried, fixed in methanol, stained in Giemsa, and mounted in balsam. Cells were examined at 400, 600, and 1,000 \times . Two slides with only *L. toddi* as redescribed by Greiner and Kocan (1977) from falconiforms and one slide with *L. toddi* and *Haemoproteus* sp. Kruse, 1890, were deposited in the University of Nebraska State Museum Harold W. Manter Laboratory Collection (HWML Coll.) as follows: HWML Nos. 36341 *Leucocytozoon toddi* Sambon, 1907, and *Haemoproteus* sp. Kruse, 1890, 36342 and 36342 with *L. toddi*, ex *Accipiter cooperii*.

Haematozoa were collected from hawks in 5 counties in central and southeastern Wisconsin in 1991, and 3 of the same plus 2 additional

counties in this area in 1992. No distribution pattern was discernible.

A single, small (62.5 μ m) unsheathed microfilaria was observed on one slide. Bennett et al. (1982) reported microfilariae from 8 species in the genus *Accipiter*, but none in *A. cooperii*. Members of the genus *Cardiofilaria* have been reported from raptors, but their microfilariae measure approximately 300 μ m (Anderson, 1992).

The number of Cooper's hawks in this study harboring *L. toddi* and *Haemoproteus* sp. was higher in all cases than reported by Greiner et al. (1975), Kocan et al. (1977), Stabler and Holt (1965), and Williams and Bennett (1978), perhaps because our samples were collected during the nesting season.

The differences in prevalence of infection rates of *L. toddi* and *Haemoproteus* sp. between the 1991 and 1992 samples can probably be explained in part by the ratios of adults to nestlings and sample sizes (Table 1). In 1991 we examined mainly adults, a smaller sample; in 1992 half of the birds in a larger sample were nestlings. In both years the prevalence of infection in breeding adults was high, ranging from 82 to 100% between sexes and years. According to Atkinson and Van Riper (1991), transmission of avian hematozoa in the northern hemisphere occurs mainly during the breeding season when the insect vectors are present and when immunologically naive nestlings and fledglings are exposed. Peirce and Marquiss (1983) found higher numbers of *L. toddi* gametocytes in nestlings than in

Table 1. Age and sex of Cooper's hawks and prevalence of infections with hematozoa.

Age/sex	1991					1992				
	N_c^*	N_p (%)	N_L (%)	N_H (%)	N_M (%)	N_c	N_p (%)	N_L (%)	N_H (%)	N_M (%)
Adult males	8	8 (100)	8 (100)	7 (88)	1 (12)	11	10 (90)	10 (90)	7 (64)	0 (0)
Adult females	11	9 (82)	9 (82)	6 (55)	0 (0)	17	17 (100)	16 (94)	9 (53)	0 (0)
Nestling males	2	1 (50)	1 (50)	0 (0)	0 (0)	17	2 (12)	2 (12)	0 (0)	0 (0)
Nestling females	2	1 (50.0)	1 (50)	0 (0)	0 (0)	12	0 (0)	0 (0)	0 (0)	0 (0)
Total	23	20 (87)	19 (83)	13 (57)	1 (4)	57	29 (51)	28 (49)	16 (44)	0 (0)

* N_c = number examined; N_p = number parasitized; N_L = *Leucocytozoon*; N_H = *Haemoproteus*; N_M = microfilariae.

adults. They detected extraordinarily high parasitemias of *L. toddi* in some raptor nestlings as early as 14 days posthatching. The number of infected nestlings versus infected adults available to compare parasitemias was insufficient to show statistical differences. However, our data established that at least some *L. toddi* infections were acquired at nesting sites in Wisconsin.

Concurrent infections were not unusual. In the 1991 males, 1 had *L. toddi*, 6 were found to have both *L. toddi* and *Haemoproteus* sp., and 1 had *L. toddi*, *Haemoproteus* sp., and a microfilaria. Four females harbored *L. toddi*, 5 harbored *L. toddi* and *Haemoproteus* sp., and one harbored *Haemoproteus* sp. The nestlings were infected with only *L. toddi*. In 1992, 3 adult males harbored *L. toddi*, 7 had *L. toddi* and *Haemoproteus* sp., while 8 adult females had *L. toddi*, 8 *L. toddi* and *Haemoproteus* sp., and 1 was infected with *Haemoproteus* sp. As in 1991 infected nestlings had only *L. toddi* (Table 1).

Adult birds of relative and known age (Rosenfield et al. 1992) were analyzed for prevalence of *L. toddi* and *Haemoproteus* sp., and birds of all ages were infected. The infected 5- and 6-yr-old birds showed that either they retained *L. toddi* and/or *Haemoproteus* sp. for long periods or they were being reinfected.

Using published and unpublished data on the prevalence of avian hematozoa in North America, Greiner et al. (1975) analyzed the distribution of parasite genera by region, host family, and vertical stratification of nesting sites. In their analysis, correlation between prevalence of hematozoa showed an inverse relationship to nest height on a local geographic basis—the higher the nest the fewer the parasites. All our Cooper's hawk nest sites were in their highest stratum, 4 (8 m or more). Our study suggests, however, that nest height does not protect these birds from hematozoan vectors in Wisconsin. Bennett et al.

(1975) stated that no geographic generalizations can be made about avian hematozoa epizootiology. Continuing research on blood parasites of fall migrant raptors, including Cooper's hawks, may elucidate additional aspects of these host-parasite relationships.

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